UG MICROBIOLOGY

UCMBK18 - MICROBIAL ECOLOGY AND SOIL MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: VI	UCMBK20	Microbial Ecology and Soil Microbiology	Theory	Core	5	5	100

Course Objective: To facilitate students understanding on the microorganisms present in their environments and their habitat, microbial interaction, biogeochemical cycling and waste management.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Compare the role of microbial communities in the environment and discuss on the significance of Aero and Water Microbiology

CO2: Assess on the microbiological aspects of management of sewage and design the treatment procedures.

CO3: Outline on the importance of bioremediation and biodegradation of xenobiotic compounds.

CO4: Familiarize with microorganisms of soil and their role in biogeochemical cycle.

CO5: Comprehend the importance of plant- microbe interactions.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	M
CO2	H	H	H	L	L	M
CO3	H	M	M	H	M	M
CO4	H	M	H	H	M	M
CO5	H	M	H	M	M	M

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	M
CO2	H	L	H	M	L	M
CO3	H	M	H	L	L	M
CO4	H	H	H	M	L	L
CO5	H	L	H	L	L	M

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

UNIT I: Aero Microbiology and Water Microbiology. (15 hours)

1.1 Microbes of air, Droplet, Droplet nuclei, aerosol.Assessment of air quality, solid- liquid impingement method. (K1,K2,K3,K4)

1.2 Brief account of air borne transmission of microbes and diseases. (K1,K2)

1.3 Microbiology of water – Types of water- potability of water (K1,K2)

1.4 Microbial assessment of water quality. (K1,K2,K3,K4)

1.5 Brief account on water borne diseases. (K1,K2)

1.6 Municipal water treatment method process. (K1,K2,K3,K4)

UNIT II: Sewage treatment. (15 hours)

2.1 Sewage– Chemical and Microbiological characteristic of sewage. (K1,K2)

2.2 Types of wastes - Characterization of solid and liquid waste (K1,K2)

2.3 Sewage treatment methods– Primary treatment. (K1,K2,K3)

2.4 Sewage treatment - Secondary, anaerobic – methanogenesis, aerobic – trickling filters , activated sludge, oxidation pond. (K1,K2,K3)

2.5 Tertiary treatment- sewage disinfection. (K1,K2,K3)

2.6 Utilization of solid and liquid wastes- saccharification – gasification – composting. (K1,K2,K3)

UNIT III: Biodeterioration and remediation. (15 hours)

1.1 Bioaugmentation, recalcitrants/xenobiotic compounds -Bioremediation, biodeterioration- Definition. (K1,K2)

1.2 Deterioration of paper. (K1,K2,K3)

1.3 Deterioration of leathers. (K1,K2,K3)

1.4 Deterioration of wood. (K1,K2,K3)

1.5 Deterioration of textiles /fabrics. (K1,K2,K3)

1.6 Metal corrosion – Biocorrosion. (K1,K2,K3)

UNIT IV: Microbiology of soil. (15 hours)

1.1 Microorganisms in soil – qualitative and quantitative microflora of different soils. (K1,K2,K3)

1.2 Role of microorganisms in soil fertility. Enumeration of microorganisms in soil. (K1,K2,K3)
1.3 Factors affecting soil microflora – moisture, pH, temperature, organic matter, agronomic practices. (K1,K2,K3)
1.4 Bio-Geo chemical cycles – Nitrogen cycle (K1,K2)
1.5 Phosphorus cycle and sulphur cycle. (K1,K2)
1.6 Carbon cycle and iron cycle. (K1,K2)

UNIT V: Plant - Microbe interactions. (15 hours)

1.1 Overview on Plant Microbe interactions. (K1,K2)

1.2 Inter relationships between plants and Microorganisms – Rhizosphere, Rhizoplane, Phyllosphere, Spermosphere – their importance in plant growth. (K1,K2)

1.3 Mycorrhiza – ecto and endo mycorrhiza – AM fungi – distribution and importance. (K1,K2, K3)

1.4 Lichens and their role. (K1,K2)

1.5 Symbiotic Nitrogen fixation - Root nodule bacteria. (K1,K2, K3)

1.6 Non- symbiotic nitrogen fixation (K1,K2,K3)

TEXT BOOKS:

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1st edition, MJP publishers. Chennai
2. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1st edition, Bright Sun publications, Chennai.
3. Subba Rao N.S (2004). Soil Microbiology. 4th edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Murugesan A.G and Rajakumari C (2005). Environmental Science and Biotechnology. 1st edition, MJP Publishers, Chennai.
2. Singh D.P and Dwivedi S.K (2005). Environmental Microbiology and Biotechnology. 1st edition, New Age International (P) Ltd., New Delhi.
3. Mishra RR (2004). Soil Microbiology. 1st edition, CBS Publishers and distributors, New Delhi.
4. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. 4th edition, PHI Learning (P) Ltd., New Delhi.

5. Atlas R.M. and Bartha R (1992). Microbial Ecology, Fundamental and Application, 3rd edition, Bengamin and Cummings. United States.

OER:

E- CONTENT FOR LEARNING:

1. http://www.learnerstv.com/
2. http://webcast.berkeley.edu/
3. http://cosmolearning.org/
4. http://www.world-lecture-project.org/
5. http://cec.nic.in/
6. http://epgp.inflibnet.ac.in/
7. http://www.co-learn.in/

UAMBB20- ALLIED IV: MICROBIOLOGY – II

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	UAMBB20	Allied IV: Microbiology-II	Theory	Allied	4	4	100

Course Objective: To make the students know about the third major component of the biotic system and provide a detailed insight on the significance microbes in different environments.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Discuss the role of microorganisms in soil and biogeochemical cycles.

CO2: Disseminate knowledge on the potability of water, purification of municipal water supplies and sewage treatment process

CO3: Communicate sources of airborne pathogens and the diseases caused.

CO4: Explain Food borne diseases and outline on the contamination, spoilage and preservation of food.

CO5: Compile on different types of fermentation and fermented microbial product.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	L	L	M
CO4	H	H	H	L	L	M
CO5	H	H	H	L	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	M
CO2	H	H	H	M	L	M
CO3	H	H	H	L	L	M
CO4	H	H	H	L	L	M
CO5	H	H	H	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

UNIT I: Microbiology of soil and Biogeo chemical cycle. (12 hours)

1.1 Microbiology of soil - Microbes in soil. (K1,K2)

1.2 Rhizosphere, rhizoplane and phylloplane. (K1,K2)

1.3 Nitrogen fixation (symbiotic and non-symbiotic) - nitrifying and denitrifying bacteria. (K1,K2)

1.4 Biogeo chemical cycle – Carbon cycle, Nitrogen cycle. (K1,K2)

1.5 Sulphur cycle and phosphorus cycle. (K1,K2)

1.6 Phosphate solubilizers and sulphur bacteria -Bacterial Biofertilizers. (K1,K2)

UNIT II: Microbiology of water. (12 hours)

1.1 Microbiology of water – types of water – potable water. (K1,K2)

1.2 Municipal water purification. (K1,K2)

1.3 Sewage treatment process – An overview. (K1,K2)

1.4 Primary, Secondary and tertiary treatment process. (K1,K2)

1.5 Sewage disinfection and disposal. (K1,K2)

1.6 Water borne diseases. (K1,K2)

UNIT III: Aero Microbiology. (12 hours)

1.1 Microbiology of air- An overview. (K1,K2)

1.2 Indoor and outdoor microflora. (K1,K2)

1.3 Distribution and source of airborne organisms – Droplet, Droplet nuclei and Infectious dust. (K1,K2)

1.4 Assessment of air quality. (K1,K2, K3)

1.5 Air sanitation. (K1,K2, K3)

1.6 Airborne diseases. (K1,K2)

UNIT IV: Food Microbiology (12 hours)

1.1 Food Microbiology – An introduction. (K1,K2)

1.2 Food preservation techniques- asepsis, high temperature and low temperature. (K1,K2,K3)

1.3 Food preservation techniques – drying, radiation and food additives. (K1,K2, K3)

1.4 Microbial spoilage of food - vegetables and fruits, cereal and cereal products. (K1,K2)

1.5 Microbial spoilage of food – meat and meat products, milk and milk products. (K1,K2)

1.6 Food borne diseases. (K1,K2)

UNIT V: Fermentation and Industrial production. (12 hours)

5.1 Fermentation- types of fermentation. (K1,K2)

5.2 Fermentor- structure and types. (K1,K2)

5.3 Industrial production – Antibiotic (Penicillin). (K1,K2)

5.4 Industrial production - alcohol (Ethanol). (K1,K2)

5.5 Industrial production - organic acid (acetic acid). (K1,K2)

5.6 Industrial production - Vitamin (B12). (K1,K2)

TEXT BOOKS:

1. Frazier W.C. and West Hoff D.C (2008). Food Microbiology. 4th edition. Mc Graw Hill, New York.
2. Joseph C. Daniel (1999). Environmental aspects of Microbiology. 1st edition, Bright Sun publications, Chennai.
3. Subba Rao NS (2004). Soil Microbiology. 4th edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1st edition, MJP publishers. Chennai
2. Casida, J.E (1986), Industrial Microbiology.1st edition. Wiley Eastern publishers.UK
3. Patel A.H (2001). Industrial Microbiology. 3rd edition. Mac Millan India ltd, Chennai.

OER:

E-books

1. www.gutenberg.org
2. www.free-ebooks.net
3. www.e-booksdirectory.com

Video lessons

1. www.learnerstv.com
2. www.webcast.berkeley.edu
3. www.cosmolearning.org

UGMBB20 – NON MAJOR ELECTIVE: WASTE WATER MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: V **&** VI	UGMBB20	Waste water Microbiology	Theory	Non Major Elective	3	2	100

Course Objective: To provide in depth knowledge on the significance of waste water and on waste water and its treatment cum recycling methods.

Course Outcomes (CO):

At the end of the course, the learners will be able to;

CO1: Use the available technologies for physical, chemical and biological treatment of municipal water.

CO2: Demonstrate the microbiological analysis of potable water and brief out water borne diseases.

CO3: Outline bioremediation of pesticides, heavy metals and oil spills.

CO4: Explain the sewage treatment process.

CO5: Utilization of solid and liquid waste.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	L	L	H
CO2	H	M	H	M	L	M
CO3	H	H	H	L	M	H
CO4	H	L	H	L	L	M
CO5	H	L	H	L	L	M

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	M
CO2	H	M	H	L	M	M
CO3	H	M	H	L	H	H
CO4	H	H	H	L	M	H
CO5	H	M	H	L	M	M

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

UNIT I: Microbiology of water and treatment of municipal water supplies. (9 hours)

1.1 Microbiology of water. (K1,K2)

1.2 Types of water. (K1,K2)

1.3 Potability of water. (K1,K2)

1.4 Sources of drinking water. (K1,K2)

1.5 Treatment method of municipal water supplies – Sedimentation and filtration. (K1,K2)

1.6 Disinfection of water- chlorination. (K1,K2)

UNIT II: Detection of potability of water and water borne diseases. (9 hours)

2.1 Indicators of faecal contamination. (K1, K2)

2.1 Methods to detect potability of water samples: Standard qualitative procedure: Most Probable Number test. (K1,K2, K3)

2.2 Membrane filtration technique. (K1,K2, K3)

2.3 Water-borne diseases- An overview. (K1,K2)

2.4 Bacterial, viral and Protozoal water borne diseases- their etiological agents and clinical symptoms. (K1,K2)

2.5 Prevention and control measures. (K1,K2, K3)

UNIT III: Water pollution. (9 hours)

3.1 Water Pollution – Definition, sources of water pollution. (K1, K2)

3.2 Pollution of water bodies by heavy metals. (K1, K2)

3.3 Removal of heavy metals by biosorption. (K1, K2)

3.4 Removal of pesticides. (K1, K2)

3.5 Marine oil spill pollution. (K1, K2)

3.6 Removal of oil spills by using microorganisms. (K1, K2)

UNIT IV: Sewage treatment process. (9 hours)

1.1 Characteristics of sewage and objectives in sewage treatment. (K1, K2)

1.2 Biological treatment of sewage: preliminary treatment. (K1, K2)

1.3 Secondary treatment - activated sludge process. (K1, K2)

1.3 Trickling filters. (K1, K2)

1.4 Anaerobic sludge digestion. (K1, K2)

1.5 Household waste water treatment. (K1, K2, K3)

UNIT V: Utilization of solid and liquid waste. (9 hours)

5.1 Utilization of solid and liquid waste: Industrial re-use of effluents. (K1, K2)

5.2 Municipal reuse of effluent. (K1, K2)

5.3 Agricultural reuse of effluent (crop irrigation). (K1, K2)

5.4 SCP production. (K1, K2)

5.5 Composting (fertilizer). (K1, K2)

5.6 Aquaculture. (K1, K2)

TEXT BOOKS:

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1st edition, MJP publishers. Chennai.
2. Atlas R.M. and Bartha R (1992). Microbial Ecology, Fundamental and Application, 3rd Edition, Bengamin and Cummings.United States.

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2. Murugesan A.G and Rajakumari C (2005). Environmental Science and Biotechnology. 1st edition, MJP Publishers, Chennai.

OER:

DIGITAL LIBRARIES:

1. http://www.loc.gov/
2. http://library.clark.edu/
3. http://www.dli.ernet.in/
4. http://www.loc.gov/education/
5. http://www.pdfdrive.com